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45. Conferencing Tools and the Productivity Paradox

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Abstract

The previous report in this series (Report #44) discusses current attitudes to distance education technology, with specific reference to the counter-productive effects of learning management systems. The current paper pursues this theme in relation to the evolution of online audio-conferencing systems in DE, and revisits the notion of the "productivity paradox" proposed by Solow (1987). It also considers the slow evolution of DE technologies in comparison with the rapid rates of development predicted by Moore's Law (1965). The paper concludes by outlining the human factors that distance educators must consider in order to harness online audio-conferencing technologies to full advantage.

Introduction

Robert Solow, Nobel Laureate in Economics, made this famous observation: "You can see the computer age everywhere but in the productivity statistics" (Solow, 1987, p. 36). Known as the Solow Paradox, or Productivity Paradox, the statement pointed out that computer technology had not lived up to its promise of raising the living standard in countries that had embraced the computer. Yet the technology itself cannot be faulted for failure to increase productivity. This paper aims to identify some of the causal factors that contribute to the paradox in distance education (DE), with particular emphasis on the promise of online audio-conferencing systems. The term "system" is used in this context, because a system is the best way to describe the complex integration of software, computers, peripherals, telecommunications, and humans that affects the issue. The paper demonstrates that no single factor contributes to the paradox.

Classic definitions of productivity involve a financial efficiency model (Carlson, 1975) focus on the coefficients of the production function. Increases in productivity are achieved either through a reduction of marginal costs (costs per unit of output), or through an increase in marginal revenue (revenue per unit of output). From a distance education perspective, this definition of productivity is problematic. Fahy (1998) has suggested that we should be cautious in accepting corporate models as a basis for measuring productivity in distance education, and that performance enhancement may be a better metric for assessing the impact of technology in DE. The current interest in online audio methods in DE provides a useful context for further discussion of these principles.

Technological Factors

It is inappropriate to blame the technology for productivity failures. Technologies are merely tools which, in the hands of skilled artisans, can produce good results. Conversely, if the tool is used by someone unfamiliar with it, its results can be disappointing or counter-productive. When technologies are blatantly defective, their applications tend to disappear. Many of the problems with technology in general, and DE audio-conferencing specifically, relate to the systems' integration rather than to failings of the individual components. With an audio-conferencing system, one has to consider the capacities of the computers used by the teachers and students, the quality of its sound card, headphones, and microphones, issues of Internet connectivity and bandwidth; and these factors must be assessed on both the client and server sides. In addition, many audio-conferencing systems require the service of a third-party server to handle the communication traffic; and the reliability of this server has a central bearing on the system's overall performance. Although each individual component of the system may be functional and state-of-the-art, difficulties can arise in their integration. Some components may be incompatible, causing conflicts that render the whole system inoperable.

Emerging technology is usually compared to its predecessor. As McLuhan observed (1964), each new medium is interpreted relative to an older, similar medium. The implications of this statement for computer conferencing have been discussed by Anderson, Rourke, Archer, and Garrison, (2001). The quality and ease of use of audio-conferencing, for example, can be compared with the more mature technology of the telephone. This sets up the expectation that, if unfulfilled, results in disappointment on the user's part, and in rejection of the new technology. Emerging technology has to mature before it can be accepted. While Voice Over Internet Protocol (VoIP) promises greater connectivity at reduced costs, notably for individuals separated by great distances, this connectivity can be cumbersome and costly. Indeed, some VoIP providers are charging higher long-distance fees than the telephone companies. Ironically, the greatest productivity contribution of the emerging technology may be that it is forcing competition upon the more mature technologies. There has been relatively little development in the VoIP technologies themselves during the past five years. In some ways, the technology's efficiency actually appears to have declined. Faculty members of Athabasca University's Centre for Distance Education were teaching via VoIP methods in 1999 (Baggaley, 2004), using the *FireTalk* software. Although communication via this software was still adversely affected by occasional delays, students forgave this deficiency in view of the application's user-friendliness. Unfortunately, the *FireTalk* freeware did not survive in the marketplace. The applications that have replaced it still suffer from communication delays and server outages at times of heavy Internet traffic, and their overall user-friendliness has not markedly improved. Microsoft, for example, has not released a new version of its *NetMeeting* conferencing software since 1999.

Another well-known set of observations with regard to technological development was provided by Moore (1965). "Moore's Law" would suggest that we have experienced an eight-fold increase in computing power since 1998 (Silicon, 2003), yet exploitation of that capacity is not evident in today's online audio-conferencing software. The range of audio-conferencing products has expanded dramatically during the past five years (see other reports in this series), yet their lack of robustness and user-friendliness is surprising given the advances in computing hardware during the same period. Ultimately, this lack of development may prove beneficial, allowing users to "catch up" with the applications, and enabling a critical mass of users to develop. The general lack of advancement, however, indicates deficiency in the economic model of the Internet on which online audio-conferencing has been based.

There is a wide range of Internet business models (Rappa, 2005). At one extreme, free and open source software (OSS) is advocated, and the other there are those who wish to extract as much financial gain from their products as possible. Each end of the spectrum demonstrates the productivity paradox at work. The lack of sustainability of the OSS/ freeware philosophy is emerging as unproductive, in that users are frustrated with the need to invest time and effort in learning to use a system, only to have it disappear. Moreover, many freeware applications rely on

the use of advertising to support their development, a strategy that has had an adverse effect in turning people away from the products. OSS applications have also suffered from lack of consistency in their development. Alternatively, the financial profit model has led to the development of software so costly that the user's return on investment (ROI) diminishes, and economies of scale or productivity increases can be powerless to make the application cost-effective. Morningstar, Schubert and Thibeault (2004), in a recent software evaluation report ([Report # 41](#)) about the new *WebCT Vista* learning management system cite a potential cost increase for some institutions sixteen times greater than their current annual cost. These writers question whether such a costly proprietary product can survive.

Human Factors

Beyond the technological issues affecting the productivity paradox in the conferencing, a complex range of human factors is evident. The major investment in technology from the DE student's perspective are often not financial at all; instead the investment is the time and effort spent in becoming familiar with the system's software. This is certainly the case in relation to audio-conferencing, in which field productivity failure appears to stem from software's under-use. It has been suggested that for a technology to start having a significant effect on productivity it must reach a penetration of at least 50 percent (Economist, 2000), whereas synchronous audio techniques in North American DE appear to be used at far lower levels than this. Synchronous chat, both text and audio based, has gained a following among younger users. Bates (2000) has suggested "that technology-based learning is more acceptable and more affordable to working adults"; yet the use of synchronous communication methods in DE may not suit all students' schedules or learning styles. The working day restricts the amount of time available for synchronous learning, and the problem is compounded by the wide range of time-zones that separate the members of a typical DE class. In this context, class members often revert to asynchronous methods in order to arrange meetings, and may fall back upon that mode exclusively for their general interactions. Students' learning styles may also affect their software preferences. Whereas asynchronous conferencing methods encourage rapid reflective thinking, the think-on-your-feet style of discussion generated by synchronous audio-conferencing can be disconcerting for students unaccustomed to that style of online interaction.

Moreover, older adults who are the typical consumers of DE may be technologically challenged – perhaps more so than generally assumed. This, in turn, may impede their ready adoption of audio-conferencing techniques. Older adults may also perceive the typical uses of freeware chat applications as juvenile, and may avoid them. Software vendors, in catering to the young user, have done little to reduce this impression. The user interface of *Yahoo Messenger*, for example, is rampant with happy face icons that appeal to the younger generation, but which must be modified if the product is to attract a mature user base. In general, each of the above human factors is likely to influence students' willingness to spend time in practising the use of synchronous conferencing applications.

Solutions to the productivity paradox of audio-conferencing software should be focused on the human element. Technology is static, and unless it is efficiently manipulated by its human users, it remains so. The technologies of DE need to have an increased life cycle in order for teachers and students to become familiar with them, before jumping ahead to the next application or version. The skills developed in using a previous version should be transferable to updated versions. The financial model of online audio-conferencing in DE needs to encourage the development of usable, sustainable systems. Modularizing applications would have the welcome effect of giving users the opportunity to "step into" a system gradually, while keeping costs reasonable. Users will only invest in what they use.

Conclusions

In view of the classical viewpoints expressed by Solow's productivity paradox (1987) and Moore's Law (1965), it is not surprising that online methods are proving slow to evolve in the distance education field. Educators can address this problem by helping to dispel the problems of technological adoption experienced by the student. Users of online audio-conferencing methods, for example, need opportunities to practise their use in a non-threatening environment where mistakes can be made – for example, small-group sessions. They must be given time to practise their audio setup skills, connection procedures, discussion skills, and moderator techniques. Educational institutions can add to the satisfaction level of student and faculty users by providing audio-conferencing servers that are not subject to the congestion problems of public third-party servers. The more practised a user becomes with a tool, the more satisfying the use of the tool becomes, and the more likely that person will become an advocate for the use of the application by others. On the part of the users, patience and perseverance is required. Previous technological revolutions have taken 50 to 60 years to mature, and to reach acceptable productivity gains. We may have to wait another decade or two before the full maturity of today's information technology is realised.

The next report in the series examines current international uses of the *CanCore* metadata system.

N.B. Owing to the speed with which Web addresses are changed, the online references cited in this report may be outdated. They are available, together with updates to the current report, at the Athabasca University software evaluation site: <http://cde.athabascau.ca/softeval/>. Italicized product names in this report can be assumed to be registered industrial or trademarks.

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